

Nursing Informatics Competencies: An Analysis of the Latest Research

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Abstract

To update the published NI competencies with the latest research findings, we conducted a literature search via CINAHL and PubMed databases from 2009 to 2011. A total of 19 articles were retrieved with 7 meeting the inclusion criteria. Five studies gave examples of NI competencies. It's possible to observe trends in NI competencies research field, including contemporary skills, foundational concepts and intellectual capabilities amongst the competencies. The studies consider progressive levels of nursing practice, and give examples of the NI competencies. Nevertheless, a need of studies that links theoretical concepts and practical real environments still remains all over the world, as well as the need for defining competencies as rapid changes in informatics processes and solutions occur.

Introduction

Scientific publications about Nursing Informatics (NI) competencies began in the late 1980s; however, the first master list of discrete NI competencies was not published until 2002¹. Since then, the NI community and nursing educators have had a keen interest in the topic. As of 2009², authors concluded consensus in the research literature still did not exist for NI competency categories and wide variability existed in the scientific approach to defining NI competency concepts. In the United States, many initiatives have been undertaken to establish consensus about NI competencies, such as Technology Informatics Guiding Educational Reform (TIGER), the Quality and Safety Education for Nurses (QSEN), and the Health Information Technology for Economic and Clinical Health (HITECH) Act. The purpose of these was to guide and reform nursing education and the nursing workforce to assure that practicing nurses are fully engaged in the development, selection, implementation, adoption, and use of informatics solutions in health care³. Thus, these efforts were directed at determining basic NI competencies for practicing nurses. With active research continuing on the topic of NI competencies, a synthesis of the current literature is needed.

Methods

To update the findings of a 2009 study² analyzing published NI competencies, we used the same criteria outlined by Carter-Templeton and colleagues. We conducted a literature search via CINAHL and PubMed databases for nursing informatics competencies. Inclusion criteria required that the articles: (a) contain a description of an informatics competency study, (b) have an original list of informatics competencies specific to nursing, and (c) be written in English². We selected studies published only from 2009 to 2011. A total of 19 articles were retrieved, and 7 met the inclusion criteria. As with the 2009 publication, articles were excluded if they did not contain an original list of informatics competencies.

Synthesis of literature

The authors, year of publication, information regarding specific competencies examples, level of practice addressed, study design, sample size, and conceptual categories used in competency lists are provided in Table 1. The studies are arranged in chronological order according to year of publication.

Table 1. Published Nursing Informatics Competencies Summary Table.

Author, Year	Competency Examples	Levels of practice	Study Design	Sample	Categories
Bond, 2009 ⁴	Yes	Dreyfus Model - From novice to expert ⁵	Literature review	Bond, 2006 ⁶	Computer basics essential for effective use of information and technology; Expertise to identify and meet information needs to support own professional practice and patients' information needs; Expertise to work within an information governance framework to ensure safe, legal and ethical use of information and technology; Appreciation of, and nurses moving into more senior roles such as nurse managers or clinical specialists need expertise in, information for quality.
Yoon, Yen, Bakken, 2009 ⁷	No	Competencies for beginning and experienced nurses were chosen for inclusion in an instrument titled SANICS.	Investigators developed a 93-item self-assessment tool based upon published and locally-developed competency statements (ANA)	337 nursing students entering the baccalaureate portion of their combined BS/MS program in 2006 (N = 158) and 2007 (N = 178)	Clinical informatics competencies: Clinical informatics role, Applied computer skills: Clinical informatics, Clinical informatics attitudes, and Wireless device skills, Basic computer knowledge and skills, Computer knowledge and skills.
Hart, 2010 ⁸	Yes	Beginner, experienced, NI specialist, innovator ¹	Delphi	25 nurses	A list of 49 core informatics competencies selected by a panel for computer skills informatics skills informatics knowledge
Dixon, Newlan, 2010 ⁹	No	None listed	A feasibility study using a phenomenological approach	12 nursing PhD students	Computer literacy and Information literacy
Flood, Gasiewicz, Delpier, 2010 ¹⁰	Yes	Novice, intermediate and advanced BSN students	Literature review	Not available	Knowledge, skills and attitudes
Chang et al, 2011 ¹¹	Yes	Beginner, experienced, NI specialist, NI innovator ¹	Delphi	23 nursing educators, 9 nurse managers	Forty-five categories were added to update the 2002 Staggers et al. study– according to the technological advances
Schleyer, Burch, Schoessler, 2011 ¹²	Yes	From novice to expert ⁵	Experience report	Expert informatics nurses	Computer literacy skills Informatics skills

Results

The first article⁴ is a literature review developed for a doctorate of Education thesis⁵ in the United Kingdom. Its purpose was to provide a framework to initiate nursing informatics as part of the nursing curriculum. The author adopted the Dreyfus and Dreyfus⁶ skill acquisition nursing model (from novice to expert) to categorize nursing practice and presented examples of competencies for each of the stated categories in Table 1. An excellent contribution from the paper is the presentation of a binary scatter chart with the competencies grouped by complexity and a proposal to include them gradually in the program curriculum.

The authors of the second study⁷ developed a new 93-item self-assessment instrument (Self Assessment Nursing Informatics Competencies Scale or SANICS) founded on published competencies statements from the American Nurses' Association as well as locally-developed ones. The competencies for beginning nurses and experienced nurses were chosen from the original Staggers et al.¹ list for inclusion in SANICS. The authors administered the SANICS instrument to 337 nursing students entering the baccalaureate portion of their combined Bachelor's and Master's (BS/MS) Program in 2006 and 2007. The authors concluded that this study provided preliminary evidence for the factor structure, internal consistency reliability, and responsiveness of the 30-item SANICS, but further testing with other samples was recommended.

The third study⁸ used a Delphi technique to assess the NI competencies required for nurse managers. The levels of practice were the same as in Staggers et al.¹: beginner, experienced, NI specialist, and NI innovator. The panel of 25 selected a list of 49 core informatics competencies in the categories listed in Table 1. The results from this research showed that "approximately 35% of the nurse manager core informatics competencies should be composed of those available from Level 2"^{8:369} (experienced nurses). These authors also used the Dreyfus model⁶ of skill acquisition to nursing (from novice to expert).

The authors of the fourth study⁹ conducted a feasibility study with 12 nursing PhD students to investigate the definition of nursing informatics and its core elements via a phenomenological approach. The intention was "to examine how future faculty viewed informatics, both conceptually and practically"^{9:83}. These authors used only two categories. The results showed agreement on three broad categories for literacy: computer, information and informatics. Nevertheless, these authors recommended more emphasis on non-computer literacy to help faculty and students improve their comprehension of informatics. Also, the study showed a need of "more emphasis on the definition and scope of informatics, as well a step-by-step approach, to guide informatics integration efforts within nursing programs."^{9:87}

The fifth study¹⁰ was a literature review resulting in the categories listed in Table 1. The authors considered the study as "one endeavor to provide nursing faculty with a much needed example of integrating information literacy assignments through a curriculum."^{10:104}

Chang et al. updated the original list of NI competencies from Staggers et al.¹ with 23 nursing educators, 9 nurse managers in Taiwan¹¹. Some categories were validated, substituted or excluded, and 45 more categories were added, most of them because of the technological advances since 2002. The authors concluded that "there are specific nursing informatics competencies required for nurses, which may apply internationally, and they should be used to guide nursing educational programming."^{11:338}

The authors from the seventh study¹² developed an experience report on how they translated the informatics competencies into the professional nursing practice from 2006 until 2011. They described NI as a "blending of the concepts reflected in the stages of clinical competence, from novice to expert, as described by Benner, and the concepts of the data to wisdom continuum [...] to help reshape nurses' thinking about describing and developing informatics competencies."^{12:169} They based their work on these categories: computer literacy skills and informatics skills. The particular contribution of this study is translating NI competencies into daily nursing practice activities, which could make nurses "to move beyond the misperception that informatics competencies were related only to computer literacy skills."^{12:170}

Discussion

Carter-Templeton, Patterson, Russel² concluded that for the six articles they analyzed in 2009, no consensus existed about the categories comprising NI competencies. In the present study, we found seven articles that met the same inclusion criteria used by Carter et al., but were published since 2009. We found that two of them were published in 2009^{4,7}, three in 2010^{8,9,10}, and two in 2011^{11,12}. The volume of work on NI competencies in the past two years is evidence of the enduring interest on investigating this issue.

The majority of studies^{4,8,10,11,12} included in this review gave examples of NI competencies. Two of them^{4,12} used the Dreyfus Model⁶ to classify the levels of nursing practice (from novice to expert), two^{8,11} addressed to the Staggers classification¹ (from beginner to innovator), one⁹ have not considered levels of nursing practice, one¹⁰ classified only the levels of BSN students and another⁷ used only the beginner and experienced levels.

Regarding the studies' design, two^{4,10} were literature reviews, two^{8,11} used the Delphi Technique with nurses, one⁷ was a psychometric analysis with BS/MS students, one⁹ was a feasibility and phenomenological study with PhD Students, and one¹² was an experience report with expert informatics nurses.

The categories while not achieve consensus, do finally seem to be consolidating a bit. It's seems to be a trend, among some of the studies^{4,7,8,11}, to include the skills set and knowledge needed to be computer fluent as the National Academy of Sciences Committee on Information Technology Literacy recommends¹³: contemporary skills, foundational concepts and intellectual capabilities. On the other hand, two of the studies^{9,12} seem to address only contemporary skills and foundational concepts.

Contemporary skills (more related to computer literacy) changes rapidly as technology changes, however foundational concepts and intellectual capabilities (more related to information literacy) are more long lasting. These are the ones that might be developed regarding trouble-shooting, decision making and changes in nursing practice. So, NI has a cross-disciplinary nature, which includes boundaries among informatics and nurse specialties¹³.

The transition from paper-based and discipline-centered health care environments to new safety-focused, computerized models result in environments that are integrated, and patient-centered¹⁴. The continuing interest in NI competencies might be explained by this transition and the concern that nurses be prepared to perform effectively in these environments.

Authors^{2,13,15} recommended that studies about NI competencies must offer examples of their insertion in nursing practice, in order to make their use more visible, and help faculty to become aware of the real use of them and guide their students with efficiency.

Overall, authors recommended that faculty in educational institutions must focus on the development of competencies in informatics, and that competencies should be grouped by complexity throughout the nursing curriculum⁴. Examples are needed about how to integrate information literacy to nursing curricula. Lists of NI competencies can be applied internationally and used as guides for nursing educational programming. Among available lists, the Staggers et al.¹ list of NI Competencies is still the most cited. There is a trend to consider the acquisition of competencies based upon a nursing model that considers novice to expert levels and to categorize nursing practice related to the use of informatics based on these levels. Authors suggested an emphasis on non-computer literacy^{4,7,8,11} and including examples of NI competencies in practice to help faculties and student better comprehend informatics, and its scope.

The Dreyfus Skill model predicts, as soon as the nurse acquire more experience, she or he gets increased grasp of the nature of particular clinical situations, with its possibilities and constraints, that guides her or his actions and interactions. So, the competent nurse is the one who moves from rule-governed thinking and acts based on an intuitive grasp of the situation, and respond to the patient in a contextualized and attuned way⁶.

Hence, authors used the Dreyfus Skills Model to consider NI competencies. The novice may use NI through use of the electronics health records, and to access data and information related to his or her practice. Otherwise, the expert nurse might use Information communication technology (ICT) to "[...] access, retrieve, utilize and/or communicate health care information within the context of nursing practice. Thus, NI can be used to change, to develop clinical nurse practice".¹⁶

Conclusion

The study presented that there is still a continuing interest in NI competencies nowadays, that may be explained by the transition and the concern that nurses might be prepared to perform effectively in **safety-focused, integrated and patient-centered** environments, in which they are being requested not only to register, retrieve data, search quality information, but mainly to use them as an important resource for planning and make informed decisions, and transform the nursing practice.

Nursing education programs and their faculty might be able to prepare nurses students, in all levels, to respond to this demand. It's possible to observe trends in NI competencies research field, including contemporary skills,

foundational concepts and intellectual capabilities amongst the competencies. The studies consider progressive levels of nursing practice, and give examples of the NI competencies. Nevertheless, a need of studies that links theoretical concepts and practical real environments still remains all over the world. The need for defining competencies as rapid changes in informatics processes and solutions occur.

References

1. Staggers N, Gassert CA, Curran C. A Delphi study to determine informatics competencies for nurses at four levels of practice. *Nurs Res.* 2002;51(8):383–390.
2. Carter-Templeton H, Patterson R, Russel C. An analysis of published nursing informatics competencies. *Studies in Health Technology and Informatics. NI 2009 Proceedings.* 2009:146 540-5.
3. TIGER Initiative. (2007). Evidence and informatics transforming nursing: 3-Year action steps toward a 10-year vision. Retrieved December 10, 2007, from https://www.tigersummit.com/uploads/TIGERInitiative_Report2007_bw.pdf.
4. Bond CS, Procter PM. Prescription for nursing informatics in pre-registration nurse education. *Health Informatics Journal* 2009 15:55.
5. Benner P, Tanner CA, Chesla CA. Expertise in nursing practice. New York: Springer,2009.
6. Bond CS. Nurses in the information age: ready, willing and able? The role of pre-registration education in preparing nurses for working in an evolving workplace. EdD thesis, University of Bristol, 2006.
7. Yoon S, Yen P, Bakken S. Psychometric properties of the self assessment of nursing informatics competencies scale. *Stud Health Technol Inform* 2009; 146: 546-50.
8. Hart, MD. A Delphi study to determine baseline informatics competencies for nurse managers. *CIN: Comput Inform Nurs* 2010; 28 (6) 364-70.
9. Dixon BE, Newlon CM. How do future nursing educators perceive informatics? Advancing the nursing informatics agenda through dialogue. *J of Professional Nursing* 2010; 26 (2) 82-9.
10. Flood LS, Gasiewicz N, Delpier T. Integrating information literacy across a BSN curriculum. *Educ Innovations* 2010 49 (2): 101-4.
11. Chang J, Poynton MR, Gassert CA, Staggers N. Nursing informatics competencies required of nurses in Taiwan. *Int J Med Inform* 80 (2011) 332-340.
12. Schleyer RH, Burch CK, Schoessler MT. Defining and integrating informatics competencies into a hospital nursing department. *CIN: Comput Inform Nurs* 2011; 29 (3) 167-73.
13. Nelson R, Staggers N. Implications of the American Nurses Association Scope and Standards of Practice of nursing informatics for nurse educators: a discussion. *Nurs Outlook* 2008;56(2) 93-4.
14. Poe SS, Abbott P, Pronovost P. Building nursing intellectual capital for safe use of information technology: a before-after study to test an evidence-based peer coach intervention. *J Nurs Care Qual* 2011; 26 (2) 110-119.
15. Graves J, Corcoran S. the study of nursing informatics. *Image: J of Schol* 1989; 21:227-31.